1970 OPERATING SUMMARY

MARKHAM TOWN

water pollution control plant

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195
Ontario

Once again we have the privilege of submitting to you our latest detailed report on financial progress and technical activity at your water pollution control plant.

The statistical information contained in this annual operating summary will undoubtedly be a useful barometer of efficiency. Of particular interest will be the comments and recommendations of the regional operations engineer, who was intimately connected with day-to-day operation throughout 1970.

Together with the extensive cost data provided, this information should assist greatly in your general understanding of the problems met and dealt with, and in furnishing a yardstick for possible future expansion.

D. S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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MARKHAM

water pollution control plant

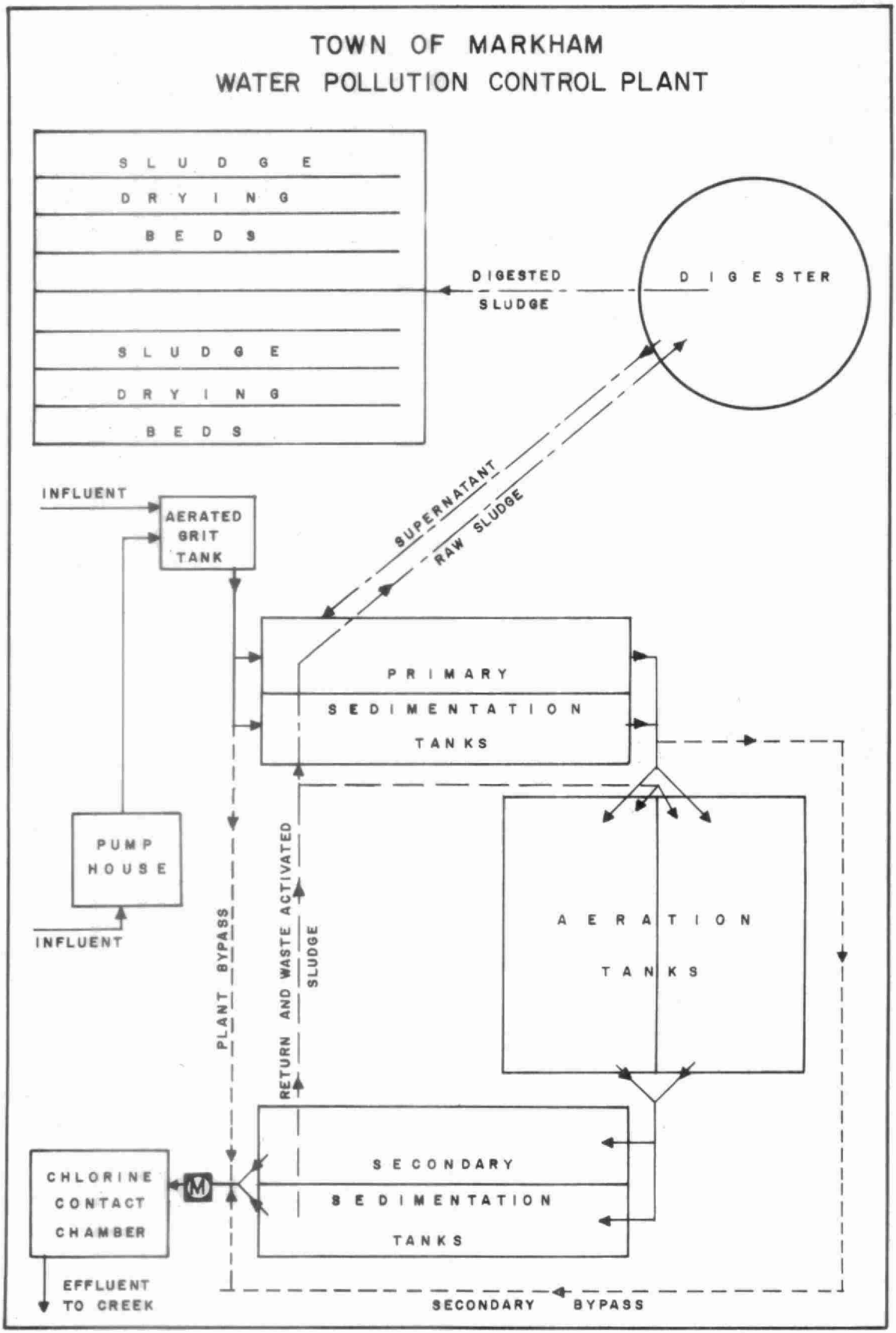
operated for

THE TOWN OF MARKHAM

by the

ONTARIO WATER RESOURCES COMMISSION

1970 ANNUAL OPERATING SUMMARY


TOWN OF MARKHAM
WATER POLLUTION CONTROL PLANT
SLUDGE DRYING BEDS
SLUDGE DRYING BEDS
DIGESTED SLUDGE
DIGESTER
SUPERNATANT
RAW SLUDGE
INFLUENT
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PRIMARY SEDIMENTATION TANKS
PUMP HOUSE
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SECONDARY SEDIMENTATION TANKS
CHLORINE CONTACT CHAMBER
M
EFFLUENT TO CREEK
SECONDARY BYPASS

DESIGN DATA

PROJECT NO.	2-0040-59	TREATMENT	
DESIGN FLOW	0.67 mgd	DESIGN POPULATION	8,000
BOD - Raw Sewage	215 mg/l	SS - Raw Sewage	220 mg/l
- Removal	95%	- Removal	95%

PUMPING STATION

Type: Fairbanks-Morse
Size: Two 350 gpm @ 40' tdh

PRIMARY TREATMENT

Comminution

Type: C.P. Barminutor
Size: One 18"

Grit Removal

Type: Aerated
Size: One 13' x 6' x 8.1' swd
(4,240 gal)
Retention: 9.2 min

Primary Sedimentation

Type: Jeffrey
Size: Two 42' x 12' x 7' 9" (avg)
(48,800 gal)
Retention: 1.76 hours
Loading: Surface, 660 gal/ft^2/day
Weir, 27,800 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air, single pass
Size: One 51' x 22' x 15' (33,600 cu ft or 210,000 gal)
One 51' x 28' x 15' (39,230 cu ft or 245,000 gal)

Air Supply

Type: Sutorbilt and Aerzen
Size: One 700 scfm @ 5 psi (standby)
One 1075 scfm

Diffusers

- 72 spargers (17" centre)

Secondary Sedimentation

Type: Jeffrey
Size: Two 42' x 12' x 10.5' (avg)
(66,000 gal)
Retention: 2.38 hours
Loading: Surface, 660 gal/ft^2/day
Weir, 4,750 gal/ft/day

CHLORINATION

Type: W & T
Size: One 70 lb/day

Chlorine Contact Chamber

Size: 20' x 11.38' x 8.5' swd (12,080 gal)
Retention: 26 min

OUTFALL

- to Exhibition Creek
(tributary of Rouge River)

SLUDGE HANDLING

Digestion System - Single-stage

Type: Mixed by recirculation
Size: One 45' dia x 20' swd (34,240 cu ft or 220,000 gal)
Loading: 0.67 lb/cu ft/ mo

Sludge Drying Beds

Size: Four 90' x 20' (7,200 sq ft)

'70 REVIEW

FLOWS	DAILY FLOW mil gal	OCCURRING IN THE MONTH OF	MONTHLY FLOW mil gal	OCCURRING IN THE MONTH OF
Average	.68	—	20.8	—
High	.93	April	24.0	April
Low	.45	July	18.7	January

GENERAL

The Markham plant is a 0.67 mgd secondary treatment facility. The treated effluent is discharged to East Creek which is a tributary of the Rouge River. The project is operated by a chief operator and one operator.

Throughout the year the plant experienced frequent difficulty with industrial wastes.

EXPENDITURES

The operating cost for the year was $36,428.20, an increase of 25 percent over 1969. Areas of increasing costs were payroll, power, sludge haulage and repairs and maintenance.

FLOWS

The average daily flow increased by 0.09 million gallons over 1969. The average daily flow of 0.68 million gallons was 101 percent of the design capacity of 0.67 mgd. The average flow figures do not include the volume of sewage received at rates greater than the flowmeter capacity of 1.0 mgd.

Peak flows greater than the design flow of 0.67 mgd were given primary treatment and chlorination. The design dry weather flow was exceeded 50 percent of the time. The final effluent was disinfected throughout the year with 8,010 pounds of chlorine to give a residual of 0.5 mg/l. The average dosage was 3.21 mg/l.

PLANT EFFICIENCY

The average raw sewage BOD and suspended solids concentrations were

196 mg/l and 260 mg/l respectively. These loadings are similar to those experienced in previous years.

The average BOD and suspended solids reduction efficiencies were both 85 percent. A total of 205 tons of BOD and 280 tons of suspended solids was removed during the year. The final effluent concentrations of 29 mg/l BOD and 38 mg/l suspended solids were above OWRC objectives of 15 mg/l for each, however, the effluent improved over previous years.

A total of 1090 cubic feet of grit was removed from the raw sewage. The average of 4.4 cubic feet of grit per million gallons of raw sewage treated is above normal.

AERATION

The average concentration of the primary effluent directed to the aeration tanks was 136 mg/l BOD and 165 mg/l suspended solids. The average mixed liquor suspended solids concentration in the aeration tanks was 2610 mg/l. The food/micro-organism ratio averaged 0.26 which was within the limits of good aeration tank operation.

SLUDGE DIGESTION and DISPOSAL

A total of 2,620,000 gallons of raw sludge was pumped to the digester. The raw sludge averaged four percent total solids of which 62 percent was volatile matter. Digested sludge averaged 3.3 percent total solids, of which 50 percent was volatile. The average reduction in volatile matter was approximately 38 percent.

A total of 5,554 cubic yards of digested sludge was hauled from the digester by tank truck. A total of 102 cubic yards of dried sludge was removed from the drying beds. Much of this dried sludge was used by local residents for lawn and garden fertilizer.

The sludge volume handled by the plant has increased considerably since the clarifiers were enlarged in 1968.

CONCLUSIONS

The plant is now operating at daily flows which exceed the design capacity 50 percent of the time. This results in an effluent which does not meet OWRC objectives.

Engineering work is now underway to increase the capacity of the plant and to provide treatment for nutrient removal.

PROJECT COSTS

2-0040-59 NET CAPITAL COST (Final)	$608,711.07
DEDUCT - Portion financed by CMHC/MDLB (Final)	
Long Term Debt to OWRC	$608,711.07
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	$164,552.18
Net Operating	$ 36,428.20
Debt Retirement	12,284.00
Reserve	2,678.50
Interest Charged	34,103.78
TOTAL	$ 85,494.48

RESERVE ACCOUNT

Balance @ January 1, 1970	$ 29,432.84
Deposited by Municipality	2,678.50
Interest Earned	1,963.59
	$ 34,074.93
Less Expenditures	518.70
Balance @ December 31, 1970	$ 33,556.23

PROJECT COSTS

2-0224-67 NET CAPITAL COST (Final)	$305,789.81
DEDUCT - Portion financed by CMHC/MDLB (Final)	306,147.99
Long Term Debt to OWRC	$ (358.18)
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	$ 0
Net Operating	$ 0
Debt Retirement	0
Reserve	0
Interest Charged	(101.29)
TOTAL	$ (101.29)

RESERVE ACCOUNT

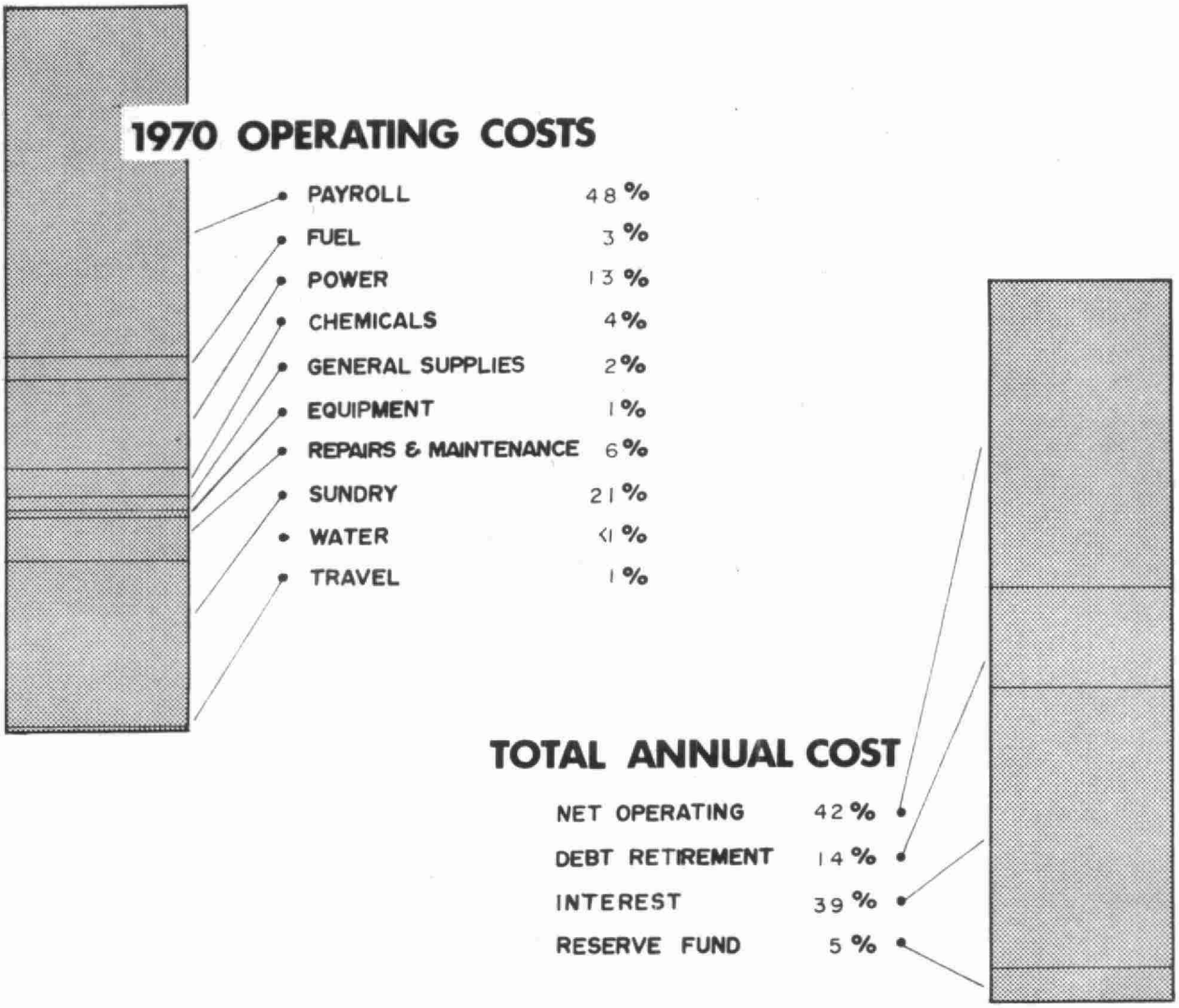
Balance @ January 1, 1970	$ 0
Deposited by Municipality	0
Interest Earned	0
Less Expenditures	$ 0
Balance @ December 31, 1970	$ 0

PROJECT COSTS

NET CAPITAL COST (Final)	$234,552.58
DEDUCT - Portion financed by CMHC/MDLB (Final)	234,552.58
Long Term Debt to OWRC	$ 0
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	$ 0
Net Operating	$ 0
Debt Retirement	0
Reserve	1,318.99
Interest Charged	0
TOTAL	$ 1,318.99

RESERVE ACCOUNT

Balance @ January 1, 1970	$ 9,331.01
Deposited by Municipality	1,318.99
Interest Earned	634.60
	$ 11,284.60
Less Expenditures	-
Balance @ December 31, 1970	$ 11,284.60



Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1966	174.330	$17,931.30	$102.86	7.3 cents
1967	224.613	20,300.68	90.38	9.3 cents
1968	204.18	21,533.20	105.46	11.5 cents
1969	216.9	29,098.52	134.16	9 cents
1970	249.0	36,428.20	146.29	9 cents

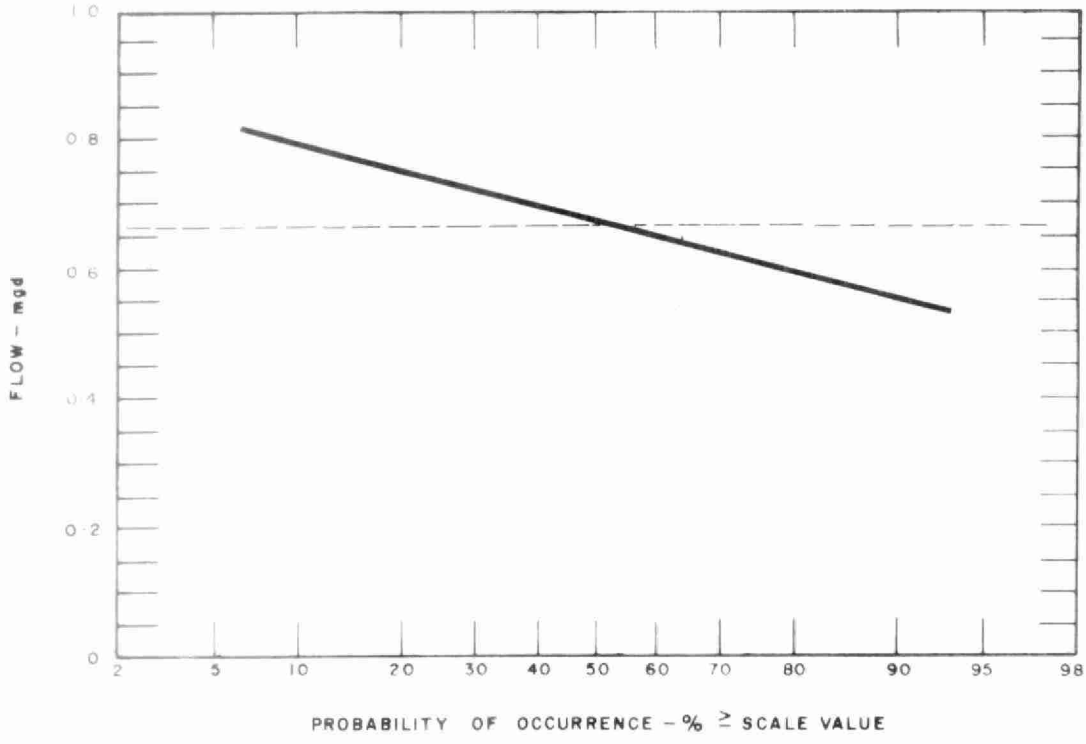
MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY *	WATER	TRAVEL
JAN	2556.12	1832.23	-	107.77	401.64	-	17.28	-	154.53	23.47	-	19.20
FEB	2454.67	1309.15	-	-	336.76	220.50	42.16	16.97	7.50	482.85	17.84	21.00
MAR	2013.39	1374.39	-	121.60	339.62	-	29.62	29.70	77.55	21.11	-	19.80
APR	3593.30	1311.41	-	231.95	446.15	220.50	163.39	-	281.54	907.03	19.18	12.15
MAY	2059.70	1443.66	-	-	389.60	-	31.64	152.25	-	22.00	-	20.55
JUNE	2501.66	1317.41	-	121.60	467.30	-	37.66	-	-	517.34	16.90	23.45
JULY	4193.36	1315.98	33.79	106.40	337.25	290.59	103.74	-	116.03	1861.38	-	28.20
AUG	3400.44	2022.04	170.60	-	458.45	-	41.88	-	-	658.25	18.62	30.60
SEPT	3201.47	1279.55	-	-	443.60	290.60	51.12	-	-	1100.45	-	36.15
OCT	4033.50	1350.59	-	-	383.55	-	160.32	79.70	1473.68	468.22	69.54	47.90
NOV	3169.68	1494.49	-	125.87	440.90	290.59	60.28	-	45.00	683.45	-	29.10
DEC	3250.91	1291.83	-	123.44	414.95	290.59	85.42	14.11	205.75	749.58	19.74	55.50
TOTAL	36428.20	17342.73	204.39	938.63	4859.77	1603.37	824.45	292.73	2361.58	7495.13	161.82	343.60

BRACKETS INDICATE CREDIT

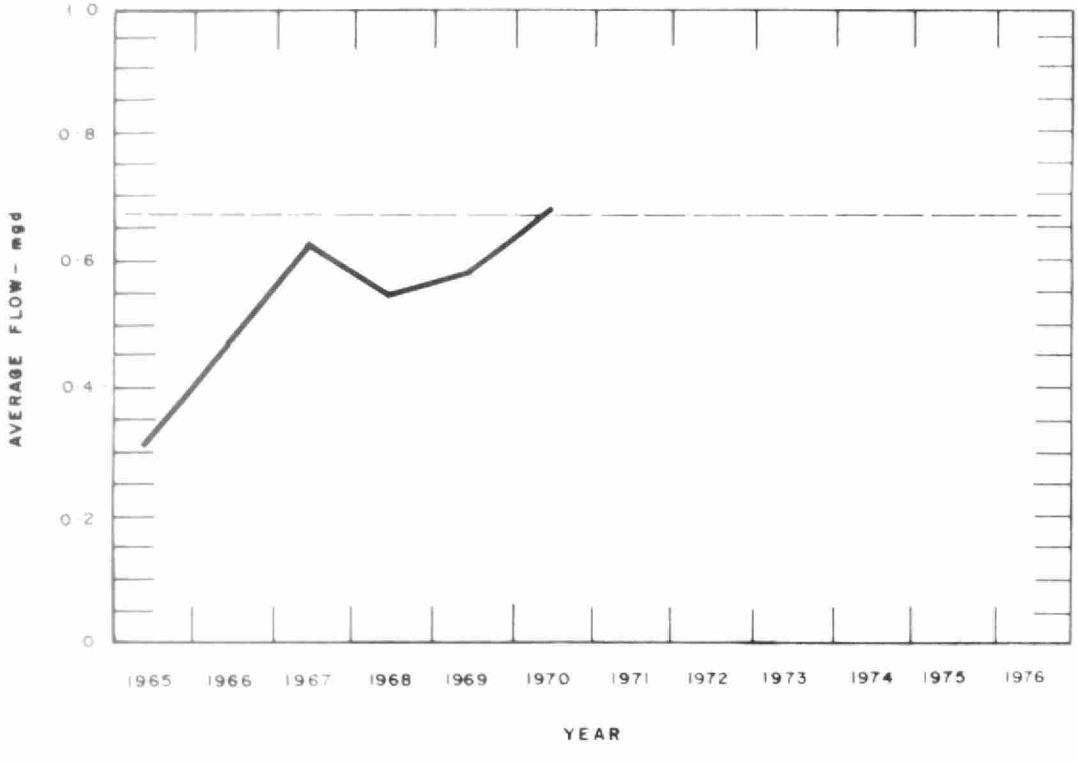
* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE $5,180.00

PROCESS DATA



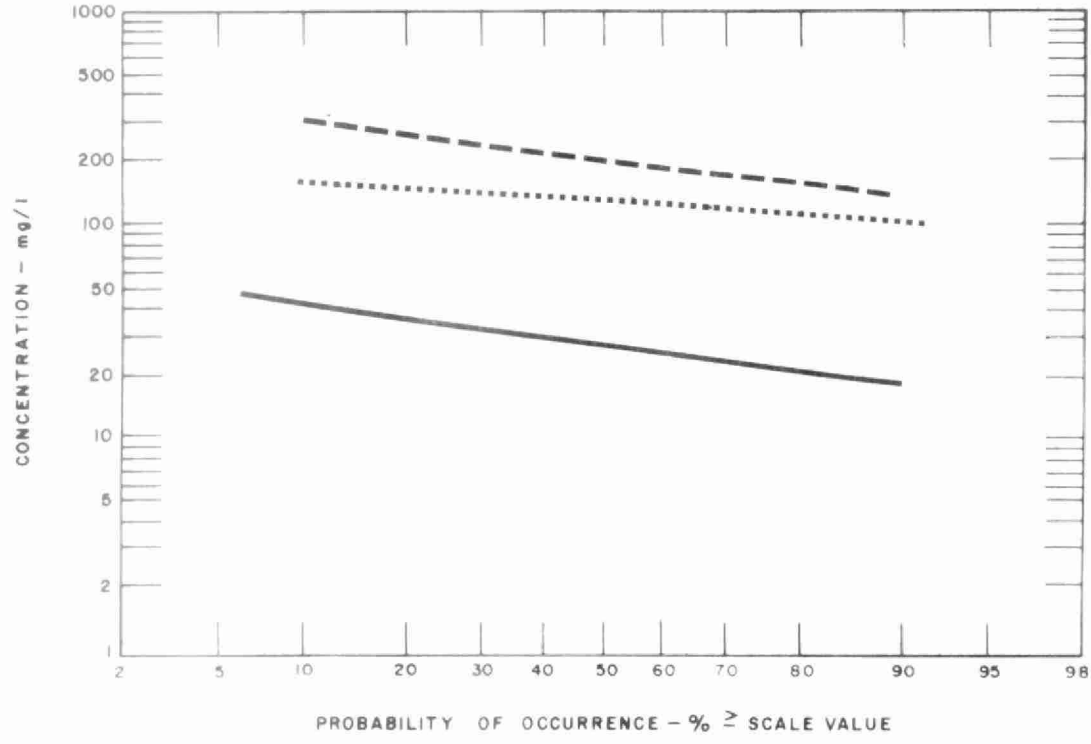
FLOWS

NOMINAL CAPACITY ——— ——— ———

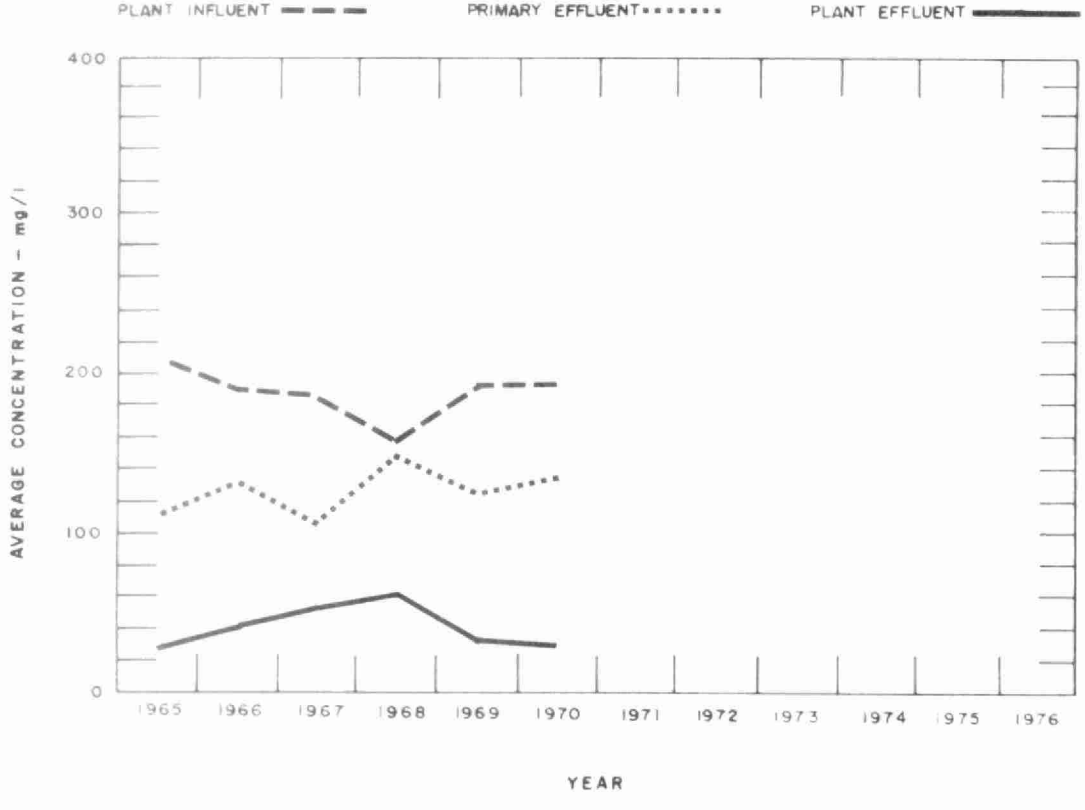


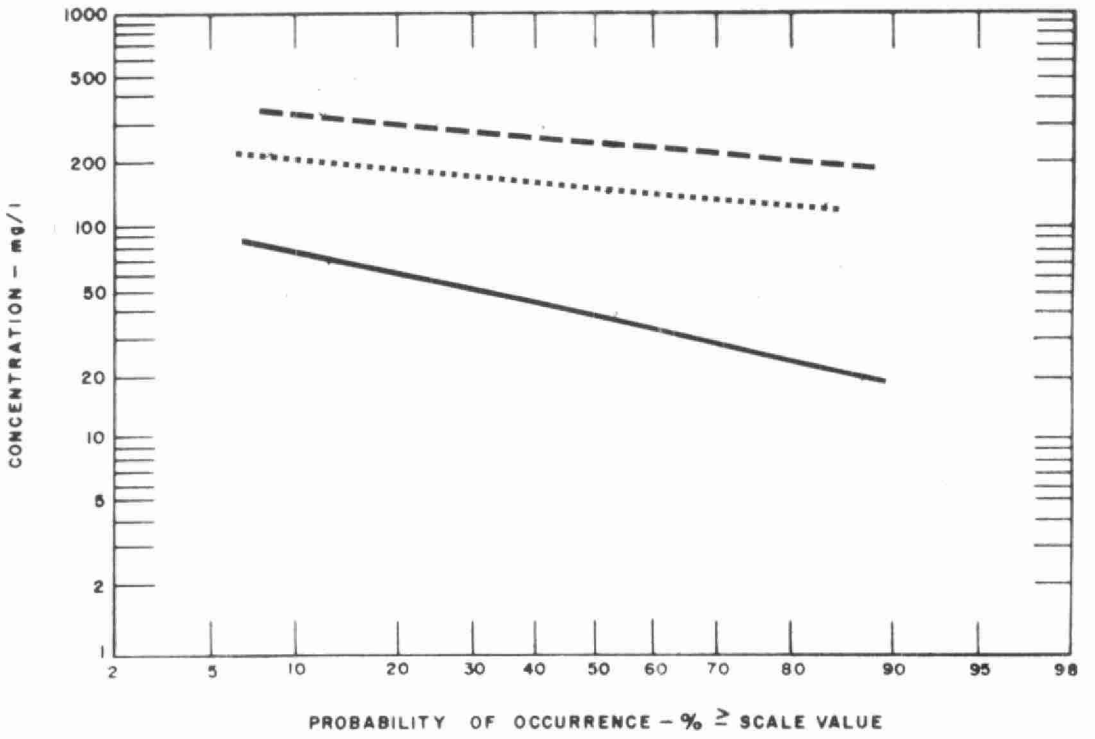
PLANT FLOWS and CHLORINATION

MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED pounds	DOSAGE mg/l
JAN	18.7	.60	.8	.5	610	3.2
FEB	17.7	.63	.8	.6	560	3.2
MAR	23.3	.75	.9	.6	620	2.7
APR	24.0	.80	.9	.7	640	2.7
MAY	22.6	.73	.9	.6	670	3.0
JUNE	20.3	.68	.8	.6	680	3.4
JULY	19.3	.62	.7	.4	710	3.7
AUG	18.9	.61	.7	.5	690	3.7
SEPT	19.3	.64	.8	.5	720	3.7
OCT	21.0	.68	.8	.6	710	3.4
NOV	21.0	.70	.8	.6	690	3.3
DEC	22.9	.73	.8	.6	710	3.1
TOTAL	249.0	-	-	-	8010	-
AVERAGE	-	.68	-	-	670	3.2

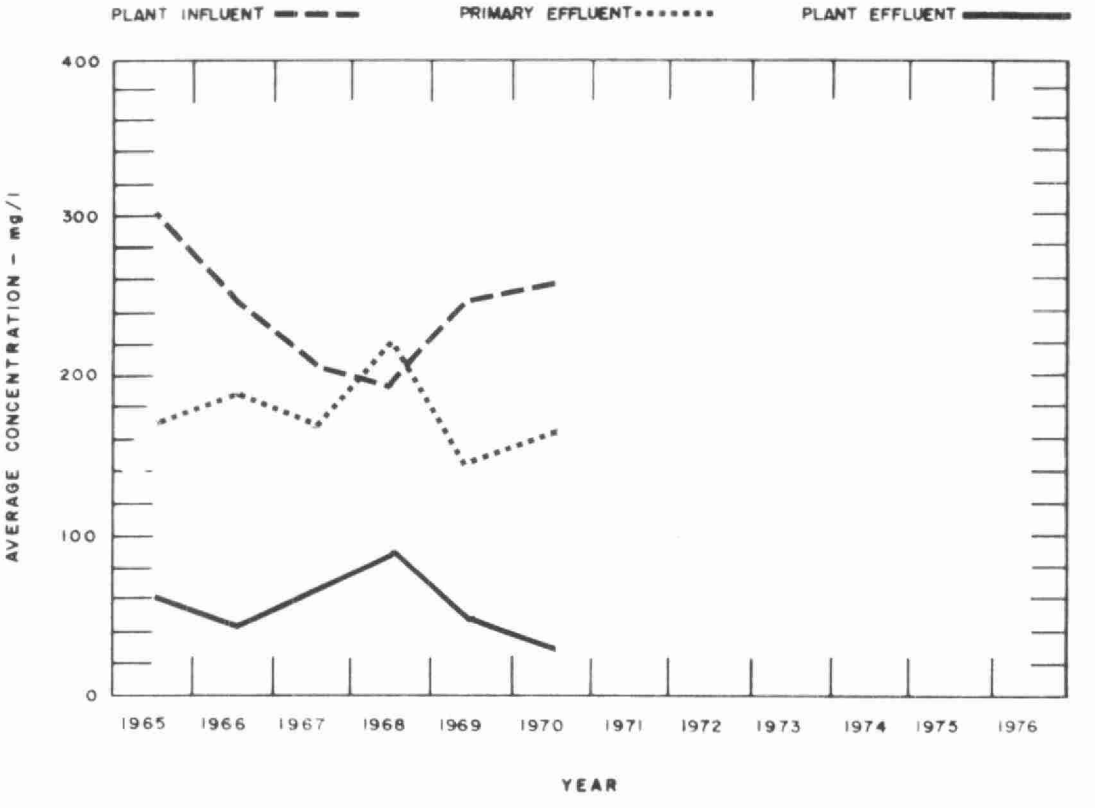


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS



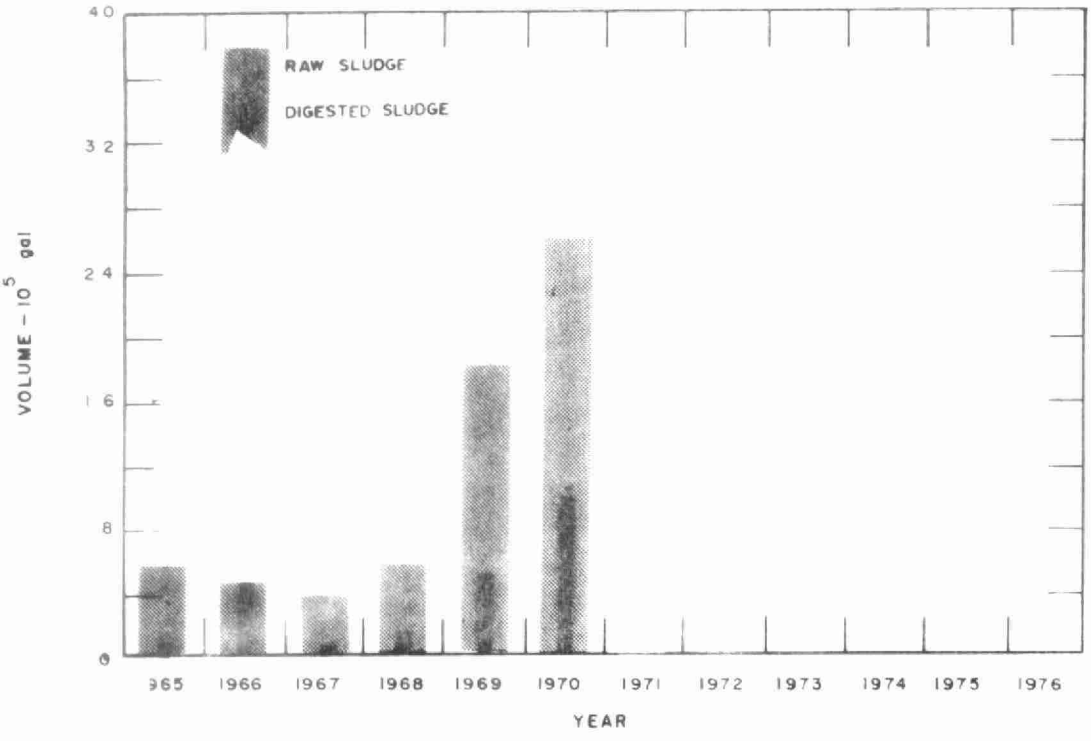
PLANT EFFICIENCY

MONTH	BIOCHEMICAL OXYGEN DEMAND						SUSPENDED SOLIDS						GRIT REMOVED
	INFLUENT		EFFLUENT		REDUCTION		INFLUENT		EFFLUENT		REDUCTION		
	n	mg/l	n	mg/l	%	10^3 pounds	n	mg/l	n	mg/l	%	10^3 pounds	cu ft
JAN	2	160	2	45	71	20	2	230	2	63	73	30	115
FEB	2	180	2	43	76	20	2	305	2	53	83	40	75
MAR	2	173	2	28	84	30	2	230	2	45	80	40	105
APR	2	165	2	21	87	30	2	172	2	33	81	30	125
MAY	2	150	2	18	88	30	2	240	2	25	90	50	100
JUNE	2	185	2	25	86	30	2	225	2	45	80	40	72
JULY	3	293	2	34	88	50	3	316	2	55	82	50	104
AUG	2	290	2	32	89	50	2	385	2	45	88	60	59
SEPT	4	190	3	31	84	30	4	257	3	27	89	40	80
OCT	2	215	2	17	92	40	2	300	2	13	96	60	83
NOV	1	200	1	15	93	40	1	330	1	15	95	60	82
DEC	2	205	2	33	84	40	2	305	2	25	92	60	90
TOTAL	26	–	24	–	–	410	26	–	24	–	–	560	1090
AVERAGE	–	196	–	29	85	40	–	260	–	38	85	50	91

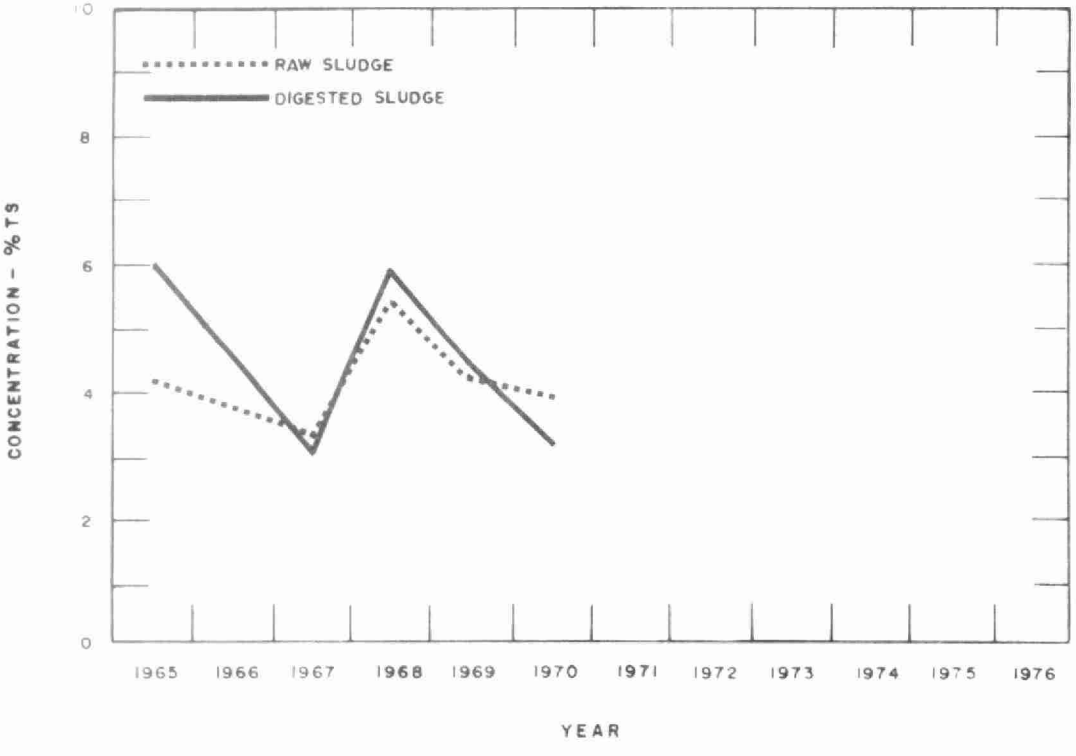
NOTE – n is the number of samples taken

AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF. BOD mg/l	AERATION INF. SS CONCN mg/l	SECONDY. EFF. BOD mg/l	SECONDY. EFF. SS CONCN mg/l	M L S S CONCN mg/l	F/M lb B O D / lb MLSS	AIR USED 1000 cu ft / lb B O D	WASTE SLUDGE lb/DAY
JAN	.60	145	207	55	40	2890	.22	3.2	-
FEB	.63	150	195	48	25	2320	.29	2.7	-
MAR	.75	160	237	23	27	3030	.28	1.7	-
APR	.80	125	180	20	28	3240	.22	2.1	-
MAY	.73	145	215	26	35	1750	.43	2.0	-
JUNE	.68	130	175	20	17	3110	.20	2.3	-
JULY	.62	140	185	41	33	2690	.23	2.8	-
AUG	.61	155	135	35	28	2340	.28	2.4	-
SEPT	.64	120	110	36	20	2310	.23	3.1	-
OCT	.68	120	115	24	13	2520	.23	2.5	-
NOV	.70	120	90	20	25	2620	.23	2.3	-
DEC	.73	130	130	27	18	2550	.27	2.0	-
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	.68	136	165	31	26	2610	.26	2.5	-

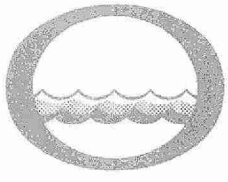

RAW SLUDGE
DIGESTED SLUDGE
VOLUME - 10^5 gal
40
32
24
16
8
0
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
YEAR

DIGESTION


RAW SLUDGE
DIGESTED SLUDGE
CONCENTRATION - % TS
10
8
6
4
2
0
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
YEAR

SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10^5 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^5 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^5 gal	TOTAL SOLIDS %	DEWATERED cu yd	LIQUID cu yd
JAN	2.0	4.2	63	.6	3.0	52	1.2	-	-	379
FEB	1.8	4.2	61	.6	3.3	54	1.0	-	-	368
MAR	2.2	4.6	60	.6	3.8	43	1.5	-	-	392
APR	2.0	4.7	63	.7	3.6	52	1.2	-	-	462
MAY	2.3	4.4	61	.6	3.4	50	1.6	-	-	295
JUNE	2.2	4.5	60	.6	3.4	51	1.6	-	-	377
JULY	2.1	4.5	58	.8	3.4	51	1.4	-	60	496
AUG	2.3	-	-	.9	-	-	1.3	-	-	413
SEPT	2.3	2.4	70	.8	-	-	1.3	-	-	378
OCT	2.3	3.7	64	1.1	-	-	1.4	-	42	568
NOV	2.3	3.8	62	1.0	2.9	51	1.1	-	-	618
DEC	2.4	3.4	62	1.4	3.1	50	1.2	-	-	808
TOTAL	26.2	-	-	9.7	-	-	15.8	-	102	5554
AVERAGE	2.2	4.0	62	.8	3.3	50	1.3	-	-	463



Water management in Ontario